

New Scan Gives Rapid Diagnosis of Chest Pain

A single 15-second scan may replace a battery of tests for serious conditions in emergency situations.

BY ROBERT FINN
San Francisco Bureau

SAN FRANCISCO — Chest pain represents one of the most common presenting symptoms in an emergent situation, and it also represents a diagnostic challenge: Is it a pulmonary embolism? Is it an aortic dissection? Is it coronary artery disease? Or is it nothing?

Now, new CT technology promises to revolutionize this diagnosis, giving the ability to rule out all three conditions with a single 15-second scan.

In theory, this scan can replace stress testing for coronary artery disease, echocardiography or CT for aortic dissection, and CT pulmonary angiography or a ventilation-perfusion scan for pulmonary embolism, Matthew J. Budoff, M.D., said at a cardiovascular imaging conference sponsored by the American College of Cardiology.

Although no diagnostic or prognostic studies on the triple rule out have yet been published, there's some indication that the single scan will have 90% accuracy or better for each of the three conditions, said Dr. Budoff of Harbor-UCLA Medical Center in Torrance, Calif.

The technology involves a 64-slice CT scan from the apex to the base of the lungs. Patients will have to hold their breath for 20-30 seconds as contrast is injected and the images are acquired. Acquisition of the slices will be gated to the

heart's rhythm, allowing for stable, high-resolution images of the heart and lungs. The slice thickness will be 0.625 mm.

Software and a sophisticated workstation will allow the clinician to construct three-dimensional images of the heart, lungs, or aorta, and to manipulate three-dimensional and two-dimensional images in a variety of ways.

In addition to aortic dissection, pulmonary embolism, and coronary artery disease, the technique will allow clear views of the pericardium, permitting the diagnosis of calcified or thickened pericardium and sometimes pericarditis.

In addition, "you might pick up pneumonia, and you might pick up pulmonary adhesions or even pericardial adhesions," Dr. Budoff said. "There are a lot of things you could possibly see. And it could be done during the chest pain episode, which is a great advantage over some of the other modalities where you'd want to wait until their chest pain is quiescent."

Dr. Budoff described the case of an elderly woman who complained of chest pain and shortness of breath. Because of her age, he was reluctant to order a stress test. The CT angiography showed that her

coronary arteries were normal and that her ejection fraction was acceptably high. When he examined the lung images closely, however, he discovered several pulmonary emboli.

"We admitted her to the hospital, put her on heparin, and it all cleared up," he said.

Despite its promise, the triple rule out does have some limitations. For one thing, it subjects patients to a relatively high dose of radiation—in the neighborhood of 24-30 millisieverts, equivalent to 240-300 chest x-rays.

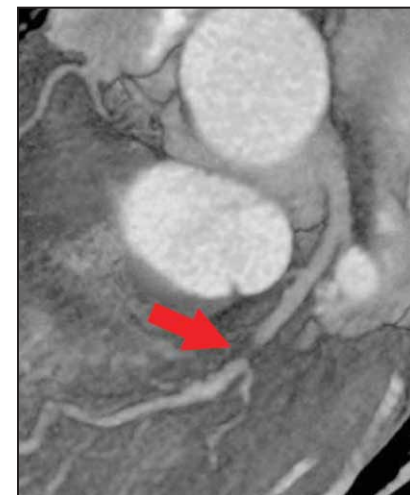
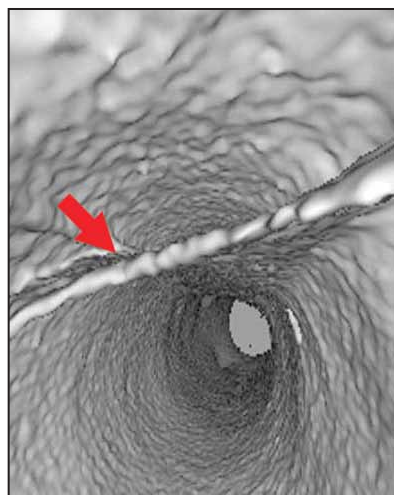
Because it's a gated study, more contrast must be used and the injection time is longer than for a standard CT. Some patients may have trouble holding their breath for 20-30 seconds.

Then there's the issue of who

is going to read these images when a patient presents at 3 a.m. The radiologist staffing the emergency department may not be facile with cardiac CT angiography. Although the images could be transferred over data lines, the cardiologist is not likely to have an appropriate workstation at home. In all likelihood, someone will have to come to the hospital to read the study.

Still, Dr. Budoff expects the triple rule out to become a routine test in the emergency department, a prospect he greets with mixed emotions.

"We really need to see how this is going to pan out, and work out the reading issues before we start applying this to everybody who comes in with a twinge in their chest or shortness of breath," he said. "I'm a little leery ... to say just because we can do it we should."



On left: An aortic dissection appears as a long, thin dissection flap in the descending aorta. In center: An endoscopic view of the aortic dissection shows the true lumen (larger area) and false lumen. On right: A high-grade stenosis is shown in the mid-left anterior descending artery.

PHOTOS COURTESY DR. MATTHEW J. BUDOFF

Device May Improve Outcomes of In-Hospital Cardiac Arrest

BY BRUCE JANCIN
Denver Bureau

VANCOUVER, B.C. — The traditional "code blue" strategy of handling in-hospital cardiac arrests has remained essentially unchanged for about 30 years, a period during which—in sharp contrast—massive resources have been devoted to improving public access defibrillation for out-of-hospital cardiac arrest, Antoni Martinez-Rubio, M.D., said at a meeting of the International Academy of Cardiology.

"We [cardiologists] have spent lots of money and done lots of reports looking at what happens outside our hospitals, but we have not looked hard enough at what happens inside our hospitals," according to Dr. Martinez-Rubio, a cardiologist at Sabadell Hospital, Barcelona.

Thirty percent of all sudden cardiac deaths occur in-hospital. The literature indicates that the acute survival rate following attempted resuscitation of in-hospital cardiac arrest is 40%-45%. Only 15%-20% of patients are discharged alive, many with permanent neurologic impairment.

Given the inefficiencies and generally poor outcomes of the code blue approach, it's time for a major change in how in-hos-

pital cardiac arrests are managed. And the necessary tool is already at hand in the form of the Food and Drug Administration-approved Powerheart Cardiac Rhythm Module (CRM), he added.

The CRM continuously monitors a patient's heart at the bedside, detects the onset of a life-threatening arrhythmia, and automatically delivers a shock for external cardioversion.

In the multicenter European trial headed by Dr. Martinez-Rubio and sponsored by Cardiac Science Inc., the mean lapsed time between arrhythmia onset and delivery of a defibrillatory shock was 15 seconds.

Contrast that with the traditional code blue scenario, in which a hospital patient is continuously monitored by telemetry in a high-cost ICU or a coronary care unit.

In such a setting a detected arrhythmia triggers an automatic alarm, which first has to be recognized by someone on the nursing staff, who then calls for the crash cart and physicians to come to the bedside.

All of this takes time. And as a recent

American Heart Association report emphasized, the earlier cardiac resuscitation can be performed, the better. Indeed, survival rates decrease by 7%-10% for every minute defibrillation is delayed, the cardiologist continued.

In addition to the 117-patient European multicenter study that was led by Dr.

Martinez-Rubio and published in the *Journal of the American College of Cardiology* (2003;41:627-32) there has also been a favorable single-center Brazilian study of the CRM (*Resuscitation* 2004;63:11-6).

In addition, physicians located at the Maimonides Medical Center in Brooklyn, N.Y., reported that the response time to simulated cardiac arrest achieved in their ICU and CCU averaged nearly 3 minutes, compared with just 38 seconds needed for the cardiac rhythm module to charge up and deliver the patient a shock (*Resuscitation* 2004;63:183-8).

"In my opinion, this should be the new standard of care," Dr. Martinez-Rubio declared.

He provided an update on an ongoing

study he is directing in which patients at risk for arrhythmic death are being randomized to traditional monitoring and code blue response in the CCU or to a stay in a regular hospital ward while connected to the Powerheart.

With 95 patients randomized to date, during 5,340 hours of monitoring outside the CCU there have been 122 arrhythmic events, including 36 cases of ventricular arrhythmia.

There are as yet no significant differences in clinical outcome; however, the cost savings achieved by using the CRM on a regular ward instead of traditional monitoring in the CCU amounts thus far to \$89,000.

And that calculation is done assuming a \$400 per day difference in the cost of staying in a regular ward, compared with staying in the CCU, which is probably a considerable underestimate.

In addition, an ongoing prospective study being conducted at the University of Michigan, Ann Arbor, is comparing the effectiveness of the traditional code blue emergency response protocol with the cardiac rhythm module in patients in the university hospital's cardiac ICU.

The study is being led by Kim A. Eagle, M.D., clinical director of the university's cardiovascular center.

The CRM continuously monitors a patient's heart at the bedside, and detects the onset of a life-threatening arrhythmia, automatically delivering an electric shock.